CLAIMS

1. A photoelectric conversion device comprising a pixel area including an effective pixel row and a reference pixel row, the reference pixel row containing a plurality of reference pixel pairs, each pair composed of a first reference pixel and a second reference pixel arranged adjacent to each other,

wherein the first reference pixel outputs a first reference signal independent of the quantity of incident light; and

the second reference pixel outputs a second reference signal having a signal level different from a signal level of the first reference signal, the second reference signal being independent of the quantity of incident light.

2. The photoelectric conversion device according to Claim 1, further comprising a scanning unit configured to scan the pixel area,

wherein the scanning unit first selects one of the reference pixel pairs in scanning of the reference pixel row.

3. The photoelectric conversion device according to Claim 2, wherein the scanning unit selects the first reference pixel of the reference pixel pair selected first.

4. The photoelectric conversion device according to any one of Claims 1 to 3, wherein the pixel area further includes a light shielded pixel row containing light shielded pixels, each including a photoelectric converter shielded from light.

5. The photoelectric conversion device according to Claim 4, wherein the signal level of the second reference signal is closer to a signal level of a signal based on the light shielded pixels than to the signal level of the first reference signal.

6. The photoelectric conversion device according to Claim 4 or 5, wherein the signal level of the second reference signal is substantially the same as a signal level of a signal based on the light shielded pixels.

7. The photoelectric conversion device according to any one of Claims 1 to 6, wherein at least one of the plurality of reference pixel pairs is disposed at an end of the reference pixel row.

8. The photoelectric conversion device according to Claim 7, wherein the first reference pixel and the second

reference pixel of the at least one reference pixel pair are arranged in this order from the end; and

another of the plurality of reference pixel pairs is disposed at an opposite end opposite the end of the reference pixel row, and the first reference pixel and the second reference pixel of the reference pixel pair at the opposite end are arranged in this order from the opposite end.

9. The photoelectric conversion device according to any one of Claims 1 to 8, wherein the reference pixel row further contains at least one temperature detecting pixel that detects a temperature of the photoelectric conversion device.

10. The photoelectric conversion device according to any one of Claims 1 to 9, wherein the plurality of reference pixel pairs are arranged adjacent to each other.

11. The photoelectric conversion device according to any one of Claims 1 to 10, wherein the first and second reference pixels are configured to be capable of switching an output between the first and second reference signals.

12. A multichip photoelectric conversion apparatus

formed by two-dimensionally arranging a plurality of semiconductor substrates, each having the photoelectric conversion device according to any one of Claims 1 to 11.

13. An image pickup system comprising:

the photoelectric conversion device according to any one of Claims 1 to 11; and

a video signal processing unit configured to process a signal output from the photoelectric conversion device to generate image data.

14. The image pickup system according to Claim 13, further comprising a light source configured to generate X-rays.

15. The image pickup system according to Claim 14, further comprising a wavelength conversion member configured to convert a wavelength of the X-rays.

16. A driving method of a photoelectric conversion device having a pixel area including an effective pixel row and a reference pixel row, the reference pixel row containing a plurality of reference pixel pairs and a light shielded pixel, each pair composed of a first reference pixel and a second reference pixel arranged adjacent to each

other, wherein the first reference pixel outputs a first reference signal independent of the quantity of incident light, and the second reference pixel outputs a second reference signal having a signal level different from a signal level of the first reference signal, the second reference signal being independent of the quantity of incident light, the driving method comprising outputting a signal from each of the first reference pixel and the second reference pixel included in one of the pairs before the light shielded pixel outputs a signal.

17. The driving method of the photoelectric conversion device according to Claim 16, wherein the signal level of the second reference signal is closer to a signal level of a signal based on light shielded pixels than to the signal level of the first reference signal, the light shielded pixels being contained in a light shielded pixel row included in the pixel area, the light shielded pixels each including a photoelectric converter shielded from light.

18. The driving method of the photoelectric conversion device according to Claim 16 or 17, wherein the signal level of the second reference signal is substantially the same as a signal level of a signal based on light shielded pixels contained in a light shielded pixel row included in the

pixel area, the light shielded pixels each including a photoelectric converter shielded from light.

CLAIMS

1. A photoelectric conversion device comprising a pixel area including an effective pixel row and a reference pixel row, the reference pixel row containing a plurality of reference pixel pairs, each pair being composed of a first reference pixel and a second reference pixel arranged adjacent to each other; and

a voltage supply unit,

wherein the first reference pixel outputs a first reference signal independent of the quantity of incident light,

wherein the second reference pixel outputs a second reference signal having a signal level different from a signal level of the first reference signal, the second reference signal being independent of the quantity of incident light,

wherein each of the first reference pixels includes a transistor that outputs the first reference signal, and each of the second reference pixels includes a transistor that outputs the second reference signal, and

wherein the voltage supply unit supplies, for each of the first reference pixels, a first voltage to a gate of the transistor, and, for each of the second reference pixels supplies, a second voltage to a gate of the transistor, the second voltage having a different voltage from the first voltage.

2. The photoelectric conversion device according to Claim 1, further comprising a scanning unit configured to scan the pixel area,

wherein the scanning unit first selects one of the reference pixel pairs in scanning of the reference pixel row.

3. The photoelectric conversion device according to Claim 2, wherein the scanning unit selects the first reference pixel of the reference pixel pair selected first.

4. The photoelectric conversion device according to any one of Claims 1 to 3, wherein the pixel area further includes a light shielded pixel row containing light shielded pixels, each including a photoelectric converter shielded from light.

5. The photoelectric conversion device according to Claim 4, wherein the signal level of the second reference signal is closer to a signal level of a signal based on the light shielded pixels than to the signal level of the first reference signal.

6. The photoelectric conversion device according to Claim 4 or 5, wherein the signal level of the second reference signal is substantially the same as a signal level of a signal based on the light shielded pixels.

7. The photoelectric conversion device according to any one of Claims 1 to 6, wherein at least one of the plurality of reference pixel pairs is disposed at an end of the reference pixel row.

8. The photoelectric conversion device according to Claim 7, wherein the first reference pixel and the second reference pixel of the at least one reference pixel pair are arranged in this order from the end; and

another of the plurality of reference pixel pairs is disposed at an opposite end opposite the end of the reference pixel row, and the first reference pixel and the second reference pixel of the reference pixel pair at the opposite end are arranged in this order from the opposite end.

9. The photoelectric conversion device according to any one of Claims 1 to 8, wherein the reference pixel row further contains at least one temperature detecting pixel that detects a temperature of the photoelectric conversion device.

10. The photoelectric conversion device according to any one of Claims 1 to 9, wherein the plurality of reference pixel pairs are arranged adjacent to each other.

11. The photoelectric conversion device according to any one of Claims 1 to 10, wherein the first and second reference pixels are configured to be capable of switching an output between the first and second reference signals.

12. The photoelectric conversion device according to any one of Claims 1 to 11,

wherein the plurality of reference pixel pairs includes a first reference pixel pair and a second reference pixel pair,

wherein the first reference pixel pair is adjacent to the second reference pixel pair,

wherein signal levels of the first reference signals of each of the first and second reference pixel pairs are the same, and

wherein signal levels of the second reference signals of each of the first and second reference pixel pairs are the same.

13. The photoelectric conversion device according to claim 12, wherein the second reference pixel of the first reference pixel pair is arranged adjacent to the first reference pixel of the second reference pixel pair.

14. A multichip photoelectric conversion apparatus formed by two-dimensionally arranging a plurality of semiconductor substrates, each having the photoelectric conversion device according to any one of Claims 1 to 13.

15. An image pickup system comprising:

the photoelectric conversion device according to any one of Claims 1 to 14; and

a video signal processing unit configured to process a signal output from the photoelectric conversion device to generate image data.

16. The image pickup system according to Claim 15, further comprising a light source configured to generate X-rays.

17. The image pickup system according to Claim 16, further comprising a wavelength conversion member configured to convert a wavelength of the X-rays.

18. A driving method of a photoelectric conversion device having a pixel area including an effective pixel row and a reference pixel row, the reference pixel row containing a plurality of reference pixel pairs and a light shielded pixel, each pair being composed of a first reference pixel and a second reference pixel arranged adjacent to each other, wherein the first reference pixel outputs a first reference signal independent of the quantity of incident light, and the second reference pixel outputs a second reference signal having a signal level different from a signal level of the first reference signal, the second reference signal being independent of the quantity of incident light, and wherein each of the first reference pixels includes a transistor that outputs the first reference signal, and each of the second reference pixels includes a transistor that outputs the second reference signal,

wherein the driving method comprising:

inputting, for each of the first reference pixels, a first voltage to a gate of the transistor;

inputting, for each of the second reference pixels, a second voltage to a gate of the transistor, the second voltage having a different voltage from the first voltage; and

outputting a signal from each of the first reference pixel and the second reference pixel included in one of the pairs before the light shielded pixel outputs a signal.

19. The driving method of the photoelectric conversion device according to Claim 18, wherein the signal level of the second reference signal is closer to a signal level of a signal based on light shielded pixels than to the signal level of the first reference signal, the light shielded pixels being contained in a light shielded pixel row included in the pixel area, the light shielded pixels each including a photoelectric converter shielded from light.

20. The driving method of the photoelectric conversion device according to Claim 18 or 19, wherein the signal level of the second reference signal is substantially the same as a signal level of a signal based on light shielded pixels contained in a light shielded pixel row included in the pixel area, the light shielded pixels each including a photoelectric converter shielded from light.